

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: 08/17/2021

TO: Holly Heldstab – WCR

FROM: Nicole Krueger – SER *Nicole Krueger*

SUBJECT: Water Quality-Based Effluent Limitations for the Village of Hilbert
WPDES Permit No. WI-0021270-11

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Village of Hilbert in Calumet County. This municipal wastewater treatment facility (WWTF) discharges to the unnamed tributary to the North Branch Manitowoc River, located in the North Branch Manitowoc River Watershed in the Lake Shore Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

The following recommendations are made on a chemical-specific basis at Outfall 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD ₅	30 mg/L			15 mg/L		
TSS	30 mg/L			15 mg/L		
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen		4.0 mg/L				1
Ammonia Nitrogen						1,3
January – March	Variable		15 mg/L	5.9 mg/L		
April – May	Variable		6.3 mg/L	2.5 mg/L		
June – September	Variable		5.2 mg/L	2.1 mg/L		
October – Dec	Variable		8.9 mg/L	3.5 mg/L		
Phosphorus						
LCA Interim Limit				1.0 mg/L		
HAC Interim Limit				0.8 mg/L		
Final WQBEL				0.225 mg/L	0.075 mg/L 0.20 lbs/day	4
Temperature						
November			54 °F			5
Nitrite + Nitrate						6
Nitrogen, Total Kjeldahl						6
Total Nitrogen						6
Acute WET						7,8
Chronic WET				1.0 TUc		7,8

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values may be included in the permit in place of the single limit. These limits apply year-round.

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	54	7.0 < pH ≤ 7.1	33	8.0 < pH ≤ 8.1	6.9
6.1 < pH ≤ 6.2	53	7.1 < pH ≤ 7.2	30	8.1 < pH ≤ 8.2	5.7
6.2 < pH ≤ 6.3	52	7.2 < pH ≤ 7.3	26	8.2 < pH ≤ 8.3	4.7
6.3 < pH ≤ 6.4	51	7.3 < pH ≤ 7.4	23	8.3 < pH ≤ 8.4	3.9
6.4 < pH ≤ 6.5	49	7.4 < pH ≤ 7.5	20	8.4 < pH ≤ 8.5	3.2
6.5 < pH ≤ 6.6	47	7.5 < pH ≤ 7.6	17	8.5 < pH ≤ 8.6	2.7
6.6 < pH ≤ 6.7	45	7.6 < pH ≤ 7.7	14	8.6 < pH ≤ 8.7	2.2
6.7 < pH ≤ 6.8	42	7.7 < pH ≤ 7.8	12	8.7 < pH ≤ 8.8	1.8
6.8 < pH ≤ 6.9	39	7.8 < pH ≤ 7.9	10	8.8 < pH ≤ 8.9	1.6
6.9 < pH ≤ 7.0	36	7.9 < pH ≤ 8.0	8.4	8.9 < pH ≤ 9.0	1.3

4. Under the phosphorus MDV, a level currently achievable (LCA) interim limit of 1.0 mg/L should be effective upon permit reissuance. A compliance schedule may be included in the permit until the highest attainable condition (HAC) limit of 0.8 mg/L can be met. The final WQBELs remain at 0.225 mg/L as a monthly average and 0.075 mg/L as a six-month average, as well as a respective mass limit.
5. A compliance schedule to meet the temperature limit may be included in the reissued permit. Temperature monitoring is recommended year-round.
6. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen (total kjeldahl nitrogen and nitrate/nitrite) monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO₃), nitrite (NO₂), and total kjeldahl nitrogen (all expressed as N).
7. Acute WET testing is recommended 2/permit term and chronic WET testing is recommended annually. The Instream Waste Concentration (IWC) to assess chronic test results is 100%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 75%, 50%, 25% & 12.5% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the North Branch of the Manitowoc River upstream from the confluence with the tributary to which Outfall 001 discharges or upstream of the permittee's discharge and out of the influence of any other known discharge.
8. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Nicole Krueger at Nicole.Krueger@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (4) – Narrative, Outfall Map, Ammonia Calculations, and Thermal Table

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Attachment #1
**Water Quality-Based Effluent Limitations for
Village of Hilbert**

WPDES Permit No. WI-0021270-11

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description:

Raw wastewater is collected via a conventional gravity sewer system from throughout the Village. At the facility wastewater is first pumped to the preliminary treatment process, consisting of a vertical spiral fine screen and a back-up manually-cleaned bar rack. Flow monitoring is performed via a magmeter in the force main, which is equipped with secondary instrumentation. Two lagoons are available for wet weather influent flow equalization. A dissolved air flotation unit follows, which is used to remove fats, oils and grease. Wastewater then enters an oxidation ditch. Alum is added, and the three channels of the oxidation ditch are operated to enhance biological phosphorus removal. Mixed liquor then flows to a single final clarifier, and the clarified effluent is discharged. Effluent flow monitoring is accomplished via a V-notch weir in an open channel preceding the outfall, which contains an ultrasonic level sensor and appropriate instrumentation. Waste activated sludge is further stabilized in an aerobic digester/holding tank, and it is then dewatered with a belt filter press. Ultimate disposal of sludge is by land application. Septage is discharged to the facility via an aerated septage receiving tank.

Disinfection of the effluent is not required based on the conditions of s. NR 210.06(3), Wis. Adm. Code. It should be noted that recreational use surveys may be re-evaluated in the future to ensure the conditions are being met. This re-evaluation could result in requiring disinfection of the effluent at that time.

Attachment #2 is a map of the area showing the approximate location of Outfall 001.

Existing Permit Limitations: The current permit, expiring on 12/31/2021, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						
BOD ₅	30 mg/L			15 mg/L		
TSS	30 mg/L			15 mg/L		
Dissolved Oxygen		4.0 mg/L				1
pH	9.0 s.u.	6.0 s.u.				1
Phosphorus Interim Final				1.0 mg/L 0.225 mg/L	0.075 mg/L 0.20 lbs/day	2
Ammonia Nitrogen January – March April – May June – September October – Dec	Variable Variable Variable Variable		15 mg/L 6.3 mg/L 5.2 mg/L 8.9 mg/L	5.9 mg/L 2.5 mg/L 2.1 mg/L 3.5 mg/L		

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Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
WET						3
Zinc						4

Footnotes:

1. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
2. A compliance schedule is in the current permit to meet the final WQBEL by January 1, 2026.
3. Acute WET testing is required 2 times during the permit term and chronic WET testing is required annually. The instream waste concentration (IWC) is 100%.
4. Monitoring only

Receiving Water Information:

- Name: Unnamed tributary of the North Branch Manitowoc River
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: The unnamed tributary is classified as Limited Forage Fish (LFF) per Table 5 in ch. NR 104, non-public water supply until the confluence with the North Branch Manitowoc River approximately 1.5 miles downstream of Outfall 001. At this point, the classification changes to Warm Water Sport Fish (WWSF) community, non-public water supply. (Cold Water and Public Water Supply criteria are used for bioaccumulating compounds of concern, because the discharge is within the Great Lakes basin.)
- Low Flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q₁₀ and 7-Q₂ values are estimates due to the intermittent nature of the stream, where Outfall 001 is located.
 $7\text{-}Q_{10} = 0 \text{ cfs (cubic feet per second)}$
 $7\text{-}Q_2 = 0 \text{ cfs}$
- Hardness = 374 mg/L as CaCO₃. This value represents the geometric mean of data from effluent data from the permit reissuance application. Effluent hardness is used in place of receiving water because there is no receiving water flow upstream of the discharge.
- % of low flow used to calculate limits in accordance with s. NR 106.06 (4) (c) 5., Wis. Adm. Code: Not applicable where the receiving water low flows are zero.
- Source of background concentration data: Background concentrations are not included because they don't impact the calculated WQBEL when the receiving water low flows are equal to zero.
- Multiple dischargers: None.
- Impaired water status: The immediate receiving water is not listed as impaired. The North Branch Manitowoc River approximately 1.5 miles downstream of Outfall 001 is 303(d) listed as impaired for total phosphorus and total suspended solids.

Effluent Information:

- Design Flow Rate(s)
Annual average = 0.326 MGD (Million Gallons per Day)
For reference, the actual average flow from 01/01/2017 to 05/31/2021 was 0.27 MGD.
- Hardness = 374 mg/L as CaCO₃. This value represents the geometric mean of data from 11/11/2020 to 11/22/2020 from the permit reissuance application.
- Acute dilution factor used in accordance with s. NR 106.06 (3) (c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water Source: Domestic wastewater with water supply from wells with industrial wastewater from

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Sargento Food and Ornuia Ingredients.

- Additives: Alum is added for phosphorus removal.
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus Ammonia, Chloride, Hardness and Phosphorus.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2, in the column titled "MEAN EFFL. CONC."

Sample Date	Copper µg/L	Sample Date	Copper µg/L	Sample Date	Copper µg/L
11/11/2020	5.8	11/25/2020	5.5	12/09/2020	4.4
11/15/2020	5.9	11/29/2020	5.3	12/13/2020	2.9
11/18/2020	5.4	12/02/2020	3.9	12/16/2020	4.1
11/22/2020	13	12/06/2020	4.0		
1-day P ₉₉ = 14 µg/L					
4-day P ₉₉ = 9.3 µg/L					
Sample Date	Zinc µg/L	Sample Date	Zinc µg/L	Sample Date	Zinc µg/L
02/24/2020	97	05/13/2020	67	09/02/2020	29
02/26/2020	97	06/03/2020	48	10/05/2020	25
03/02/2020	89	07/03/2020	26	11/02/2020	46
04/15/2020	47	08/03/2020	26	12/02/2020	35
1-day P ₉₉ = 148 µg/L					
4-day P ₉₉ = 93.5 µg/L					

Sample Date	Chloride mg/L	Sample Date	Chloride mg/L	Sample Date	Chloride mg/L
01/23/2007	283	08/01/2007	315	10/19/2013	265
02/13/2007	244	09/01/2007	298	10/22/2013	265
03/07/2007	402	10/01/2007	240	11/11/2020	223
04/01/2007	181	11/01/2007	283	11/15/2020	222
05/01/2007	193	12/01/2007	302	11/18/2020	229
06/01/2007	195	10/13/2013	291	11/22/2020	244
07/10/2007	278	10/16/2013	287		
1-day P ₉₉ = 402 mg/L					
4-day P ₉₉ = 327 mg/L					

The following table presents the average concentrations and loadings at Outfall 001 from 01/01/2017 to 05/31/2021 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

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	Average Measurement
BOD ₅	1.82 mg/L*
TSS	6.32 mg/L*
pH field	7.37 s.u.
Phosphorus	0.67 mg/L
Ammonia Nitrogen	0.28 mg/L*
Dissolved Oxygen	8.34 mg/L

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

Permit limits for toxic substances are required whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P₉₉) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q₁₀

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Adm. Code (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q₁₀ receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards.

$$\text{Limitation} = \frac{(\text{WQC}) (Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)}{Q_e}$$

Where:

WQC = Acute toxicity criterion or secondary acute value according to ch. NR 105

Q_s = average minimum 1-day flow which occurs once in 10 years (1-day Q₁₀)

if the 1-day Q₁₀ flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q₁₀).

Q_e = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d), Wis. Adm. Code.

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

C_s = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e), Wis. Adm. Code.

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q₁₀ method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is the case for Hilbert.

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The following tables list the calculated water quality-based effluent limitations for this discharge along with the results of effluent sampling. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0 cfs, (1-Q₁₀ (estimated as 80% of 7-Q₁₀)), as specified in s. NR 106.06 (3) (bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD.* mg/L	ATC	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P ₉₉	1-day MAX. CONC.
Arsenic		340	340	68.0	<14		
Cadmium	374	46.8	46.8	9.4	<0.2		
Chromium	301	4446	4446	889	<1.3		
Copper	374	53.9	53.9			14	
Lead	356	365	365	72.9	<3.5		
Nickel	268	1080	1080	216	4.4		
Zinc	333	345	345			148	
Chloride (mg/L)		757	757			402	402

* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

** Per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016 consideration of ambient concentrations and 1-Q₁₀ flow rates yields a more restrictive limit than the 2 × ATC method of limit calculation.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0 cfs (¼ of the 7-Q₁₀), as specified in s. NR 106.06 (4) (c), Wis. Adm. Code

SUBSTANCE	REF. HARD.* mg/L	CTC	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P ₉₉
Arsenic		152	152	30.4	<14	
Cadmium	175	3.82	3.82	0.8	<0.2	
Chromium	301	326	326	65.2	<1.3	
Copper	374	32.0	32.0			9.3
Lead	356	95.5	95.5	19.1	<3.5	
Nickel	268	120	120	24.0	4.4	
Zinc	333	345	345			93.5
Chloride (mg/L)		395	395			327

* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

Monthly Average Limits based on Wildlife Criteria (WC)

The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 0 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06 (4), Wis. Adm. Code.

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SUBSTANCE	HTC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	370	74.0	<0.2
Chromium (+3)	3818000	3818000	763600	<1.3
Lead	140	140	28.0	<3.5
Nickel	43000	43000	8600	4.4

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06 (4), Wis. Adm. Code.

SUBSTANCE	HCC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3	13.3	2.66	<14

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8), Wis. Adm. Code, requires the evaluation of the cumulative cancer risk. Because no effluent limits are needed based on HCC, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

Conclusions and Recommendations: Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are not required for any toxic substance in this section.

Mercury – The permit application did not require monitoring for mercury because Hilbert is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3., Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, “there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5).” A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from 08/25/2015 to 02/28/2020 was 0.28 mg/kg, with a maximum reported concentration of 1.04 mg/kg. Therefore, no mercury monitoring is recommended at Outfall 001.

Arsenic – The arsenic sample that was provided on the permit reissuance application was not detected, but the limit of detection (LOD) was 14 µg/L, which is higher than 1/5th of the calculated monthly average limit of 13.3 µg/L. In the two previous permit reissuance applications, the arsenic samples were reported as 2 µg/L and <0.6 µg/L. Because both samples were nondetect, no limits or monitoring are recommended. It is recommended that a test with a lower LOD be used in the next permit reissuance application.

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. The current permit has daily maximum, weekly average and monthly average limits. These limits are re-evaluated at this time due to the following changes:

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead

of limits set to twice the acute criteria.

- The maximum expected effluent pH has changed

Daily Maximum Limits based on Acute Toxicity Criteria (ATC):

Daily maximum limitations are based on acute toxicity criteria in ch. NR 105, Wis. Adm. Code, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation.

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.411 and B = 58.4 for a Limited Forage Fishery, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1154 sample results were reported from 01/02/2017 to 05/31/2021. The maximum reported value was 8.52 s.u. (Standard pH Units). The effluent pH was 7.94 s.u. or less 99% of the time. The 1-day P₉₉, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.92 s.u. and the mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.90 s.u. Therefore, a value of 7.94 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.94 s.u. into the equation above yields an ATC = 9.4 mg/L.

Potential Changes to Daily Maximum Ammonia Nitrogen Effluent Limitations:

Subchapter IV of ch. NR 106, Wis. Adm. Code (effective September 1, 2016) specifies methods for the use of the 1-Q₁₀ receiving water low flow to calculate daily maximum ammonia nitrogen limits if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q₁₀ (estimated as 80 % of 7-Q₁₀) and the 2×ATC approach are shown below.

	Ammonia Nitrogen Limit mg/L
2×ATC	19
1-Q ₁₀	9.4

The 1-Q₁₀ method yields the most stringent limits for Hilbert.

The current permit has variable daily maximum effluent limits based on effluent pH. Presented below is a table of daily maximum limitations corresponding to various effluent pH values.

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Daily Maximum Ammonia Nitrogen Limits – WWSF, WWFF & LFF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	54	7.0 < pH ≤ 7.1	33	8.0 < pH ≤ 8.1	6.9
6.1 < pH ≤ 6.2	53	7.1 < pH ≤ 7.2	30	8.1 < pH ≤ 8.2	5.7
6.2 < pH ≤ 6.3	52	7.2 < pH ≤ 7.3	26	8.2 < pH ≤ 8.3	4.7
6.3 < pH ≤ 6.4	51	7.3 < pH ≤ 7.4	23	8.3 < pH ≤ 8.4	3.9
6.4 < pH ≤ 6.5	49	7.4 < pH ≤ 7.5	20	8.4 < pH ≤ 8.5	3.2
6.5 < pH ≤ 6.6	47	7.5 < pH ≤ 7.6	17	8.5 < pH ≤ 8.6	2.7
6.6 < pH ≤ 6.7	45	7.6 < pH ≤ 7.7	14	8.6 < pH ≤ 8.7	2.2
6.7 < pH ≤ 6.8	42	7.7 < pH ≤ 7.8	12	8.7 < pH ≤ 8.8	1.8
6.8 < pH ≤ 6.9	39	7.8 < pH ≤ 7.9	10	8.8 < pH ≤ 8.9	1.6
6.9 < pH ≤ 7.0	36	7.9 < pH ≤ 8.0	8.4	8.9 < pH ≤ 9.0	1.3

Section NR 106.33(2), Wis. Adm. Code, was updated effective September 1, 2016. As a result, seasonal 20 and 40 mg/L thresholds for including ammonia limits in municipal discharge permits are no longer applicable under current rules. As such, the table has been expanded from the table in the current permit to include ammonia nitrogen limits throughout the pH range.

Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)

The weekly and monthly average ammonia nitrogen limits calculation from the previous memo do **not change** because there have been no changes in the effluent and receiving water flow rates. The calculations from the previous WQBEL memo are shown in Attachment #3.

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 01/04/2017 to 05/24/2021, with those results being compared to the calculated limits to determine the need to include ammonia limits in Hilbert's permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P₉₉) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Ammonia Nitrogen mg/L	January – March	April – May	June – September	October – December
1-day P ₉₉	7.5	0.2	0.7	0.6
4-day P ₉₉	4.4	0.1	0.4	0.3
30-day P ₉₉	1.88	0.07	0.18	0.14
Mean*	0.81	0.05	0.07	0.06
Std	1.86	0.04	0.20	0.15
Sample size	67	42	68	51
Range	<0.03 – 8.48	<0.03 – 0.19	<0.03 – 1.36	<0.03 – 0.797

*Values lower than the level of detection were substituted with a zero

Based on this comparison, there is no reasonable potential for the discharge to exceed any of the calculated ammonia nitrogen limits.

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The permit currently has daily maximum, weekly average, and monthly average limits year-round. Where there are existing ammonia nitrogen limits in the permit, the limits must be retained regardless of reasonable potential, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

(b) If a permittee is subject to an ammonia limitation in an existing permit, the limitation shall be included in any reissued permit. Ammonia limitations shall be included in the permit if the permitted facility will be providing treatment for ammonia discharges.

Conclusions and Recommendations:

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
January – March	Variable	15	5.9
April – May	Variable	6.3	2.5
June – September	Variable	5.2	2.1
October – December	Variable	8.9	3.5

PART 4 – PHOSPHORUS

The current permit has an interim limit of 1.0 mg/L along with a compliance schedule to meeting final water quality based effluent limits of 0.225 mg/L as a monthly average and 0.075 mg/L and 0.20 lbs/day as a 6-month average with a compliance schedule to meeting the final limits by January 1, 2026. The final WQBELs are based on s. NR 217.13, Wis. Adm. Code.

Technology Based Phosphorus Limit

Subchapter II of Chapter NR 217, Wis. Adm. Code, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of Total Phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because Hilbert currently has a limit of 1.0 mg/L, this limit should be included in the reissued permit. This limit remains applicable unless a more stringent water quality-based concentration limit is given. In addition, the need for a WQBEL for phosphorus must be considered.

Water Quality-Based Effluent Limits (WQBEL)

Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to s. NR 102.06, Wis. Adm. Code, which establish phosphorus standards for surface waters. Subchapter III of NR 217, Wis. Adm. Code, establishes procedures for determining WQBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

Section NR 102.06(3)(a), Wis. Adm. Code, specifically names river segments for which a phosphorus criterion of 0.100 mg/L applies. For other stream segments that are not specified in s. NR 102.06(3)(a), Wis. Adm. Code, s. NR 102.06(3)(b), Wis. Adm. Code, specifies a phosphorus criterion of 0.075 mg/L. The phosphorus criterion of 0.075 mg/L applies for the unnamed tributary.

The conservation of mass equation is described in s. NR 217.13 (2)(a), Wis. Adm. Code, for phosphorus WQBELs and includes variables of water quality criterion (WQC), receiving water flow rate (Qs),

effluent flow rate (Qe), and upstream phosphorus concentrations (Cs):

$$\text{Limitation} = [(WQC)(Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)] / Q_e$$

Where:

WQC = 0.075 mg/L for the unnamed tributary

Qs = 100% of the 7-Q₂ of 0 cfs

Cs = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code

Qe = effluent flow rate = 0.326 MGD = 0.504 cfs

f = the fraction of effluent withdrawn from the receiving water = 0

Since the receiving water flow is equal to zero, the effluent limit is set equal to criteria.

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from 01/02/2017 to 05/31/2021.

	Phosphorus mg/L
1-day P ₉₉	2.0
4-day P ₉₉	1.2
30-day P ₉₉	0.85
Mean	0.67
Std	0.38
Sample size	463
Range	0.1 – 3.07

Reasonable Potential Determination

The calculated WQBEL of 0.075 mg/L is less than the current technology-based limit of 1.0 mg/L, so the WQBEL must be included in the permit per s. NR 217.15(2), Wis. Adm. Code.

In accordance with s. NR 217.15(2), Wis. Adm. Code, there is reasonable potential for the discharge to cause or contribute to an exceedance of the water quality criteria. The data suggest that a compliance schedule will be necessary for the facility to meet the given phosphorus limits.

Limit Expression

According to s. NR 217.14 (2), Wis. Adm. Code, because the calculated WQBEL is less than or equal to 0.3 mg/L, the effluent limit of 0.075 mg/L may be expressed as a six-month average. If a concentration limitation expressed as a six-month average is included in the permit, a monthly average concentration limitation of 0.225 mg/L, equal to three times the WQBEL calculated under s. NR 217.13, Wis. Adm. Code shall also be included in the permit. The six-month average should be averaged during the months of May – October and November – April.

Mass Limits

Because the discharge is to a surface water that is to or upstream of a phosphorus impaired water, a mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code. **This final mass limit shall be 0.075 mg/L × 8.34 × 0.326 MGD = 0.20 lbs/day expressed as a six-month average.**

Multi-Discharge Variance Interim Limit

With the permit application, Hilbert has applied for the phosphorus multi-discharger variance (MDV). Conditions of the phosphorus MDV require the facility to comply with an interim phosphorus limit in lieu of meeting the final WQBEL for this permit term. The recommended interim limit, pursuant to s. 283.16 (6) 1, Wis. Stats., is 0.8 mg/L as a monthly average. A compliance schedule may be appropriate to meet this interim limit, but compliance with 0.8 mg/L shall be no later than the end of the reissued permit.

The current monthly limit of 1.0 mg/L is **the level currently achievable (LCA)** for the discharge. A limit of 1.0 mg/L as a monthly average should not be exceeded during the compliance schedule.

**PART 5 – WATER QUALITY-BASED EFFLUENT LIMITATIONS
FOR THERMAL**

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from 01/01/2017 to 05/31/2021.

The table below summarizes the maximum temperatures reported during monitoring from 04/01/2013 to 05/31/2014.

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
JAN	42	43	54	78
FEB	39	42	54	79
MAR	42	44	57	80
APR	47	53	63	81
MAY	59	62	70	84
JUN	65	67	77	85
JUL	71	74	81	86
AUG	72	73	79	86
SEP	70	73	73	85
OCT	63	65	63	83
NOV	55	56	54	80

Attachment #1

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly	Daily	Weekly	Daily
	Maximum	Maximum	Average Effluent Limitation	Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
DEC	43	44	54	79

Reasonable Potential

Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm. Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:
 - (a) The highest recorded representative daily maximum effluent temperature
 - (b) The projected 99th percentile of all representative daily maximum effluent temperatures
- A sub-lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
 - (a) The highest weekly average effluent temperature for the month.
 - (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. Based on this analysis, **weekly average temperature maximum limits are necessary for the month of November. Monitoring is recommended year-round.**

The following general options are available for a facility to explore potential relief from the temperature limits:

- Effluent monitoring data: Verification or additional effluent monitoring (flow and/or temperature) may be appropriate if there were questions on the representativeness of the current effluent data.
- Monthly low receiving water flows: Contract with USGS to generate monthly low flow estimates for the receiving water to be used in place of the annual low flow.
- Dissipative cooling demonstration: Effluent limitations based on sub-lethal criteria may be adjusted based on the potential for heat dissipation from municipal treatment plants (s. NR 106.59(4))
- Collection of site-specific ambient temperature: default background temperatures for streams in Wisconsin, so actual data from the direct receiving water may provide for relaxed thermal limits but only if the site-specific temperatures are lower than the small stream defaults used in the above tables
- A variance to the water quality standard: This is typically considered to be the least preferable and most complex option as it requires the evaluation of the other alternatives.

These options are explained in additional detail in the August 15, 2013 Department *Guidance for Implementation of Wisconsin's Thermal Water Quality Standards*
<http://dnr.wi.gov/topic/surfacewater/documents/ThermalGuidance2edition8152013.pdf>

PART 6 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document (October 29, 2019)*.

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC₅₀ (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09 (2) (b), Wis. Adm Code.
- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC₂₅ (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09 (3) (b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of 100% as specified in s. NR 106.03(6), Wis. Adm Code:

$$\text{IWC (as \%)} = Q_e \div \{(1 - f) Q_e + Q_s\} \times 100$$

Where:

Q_e = annual average flow = 0.326 MGD = 0.504 cfs

f = fraction of the Q_e withdrawn from the receiving water = 0

Q_s = $\frac{1}{4}$ of the 7- Q_{10} = 0 cfs \div 4 = 0 cfs

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.
- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the North Branch of the Manitowoc River upstream from the confluence with the tributary to which Outfall 001 discharges or upstream of the permittee's discharge and out of the influence of any other known discharge.. The specific receiving water location must be specified in the WPDES permit.
- Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08 (3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations. Significant changes were made to WET test methods in 2004 and these changes were assumed to be fully implemented by certified labs by no later than June 2005.

WET Data History

Date Test Initiated	Acute Results LC ₅₀ %				Chronic Results IC ₂₅ %				Footnotes or Comments
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	<i>C. dubia</i>	Fathead Minnow	Pass or Fail?	Use in RP?	
02/13/2007	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
06/18/2013					90.4	>100	Fail	Yes	
08/27/2013					>100	>100	Pass	Yes	
09/17/2013					>100	>100	Pass	Yes	
04/10/2018					86.2	>100		No	1
06/05/2018					>100	>100	Pass	Yes	
07/16/2019	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
10/20/2020					>100	>100	Pass	Yes	

Footnotes:

1. *Qualified or Inconclusive Data.* Data quality concerns were noted during testing which calls into question the reliability of the test results.
- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

$$\text{Acute Reasonable Potential} = [(TUa \text{ effluent}) (B)(AMZ)]$$

$$\text{Chronic Reasonable Potential} = [(TUc \text{ effluent}) (B)(IWC)]$$

According to s. NR 106.08(6)(d), Wis. Adm. Code, TUa and TUc effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC₅₀, IC₂₅ or IC₅₀ ≥ 100%).

Acute Reasonable Potential = 0 < 1.0, reasonable potential is not shown, and a limit is not required.

$$\text{Chronic Reasonable Potential} = [(TUc \text{ effluent}) (B)(IWC)]$$

TUc (maximum) 100/IC ₂₅	B (multiplication factor from s. NR 106.08(5)(c), Wis. Adm. Code, Table 4)	IWC
100/90.4 = 1.1	6.2 Based on 1 detects	100%

$$[(TUc \text{ effluent}) (B)(IWC)] = 6.86 > 1.0$$

Therefore, reasonable potential is shown chronic WET limits using the procedures in s. NR 106.08(6) and representative data from 02/13/2007 to 10/20/2020.

Expression of WET limits

Chronic WET limit = $[100/IWC]$ TU_c = 1.0 TU_c expressed as a monthly average

Attachment #1

The WET Checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other related permit conditions. The Checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code. The Checklist steps the user through a series of questions, assesses points based on the potential for effluent toxicity, and suggests monitoring frequencies based on points accumulated during the Checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. A summary of the WET Checklist analysis completed for this permittee is shown in the table below. Staff recommendations based on best professional judgment are provided below the summary table. For guidance related to reasonable potential and the WET Checklist, see Chapter 1.3 of the WET Guidance Document: <https://dnr.wisconsin.gov/topic/Wastewater/WET.html>.

WET Checklist Summary

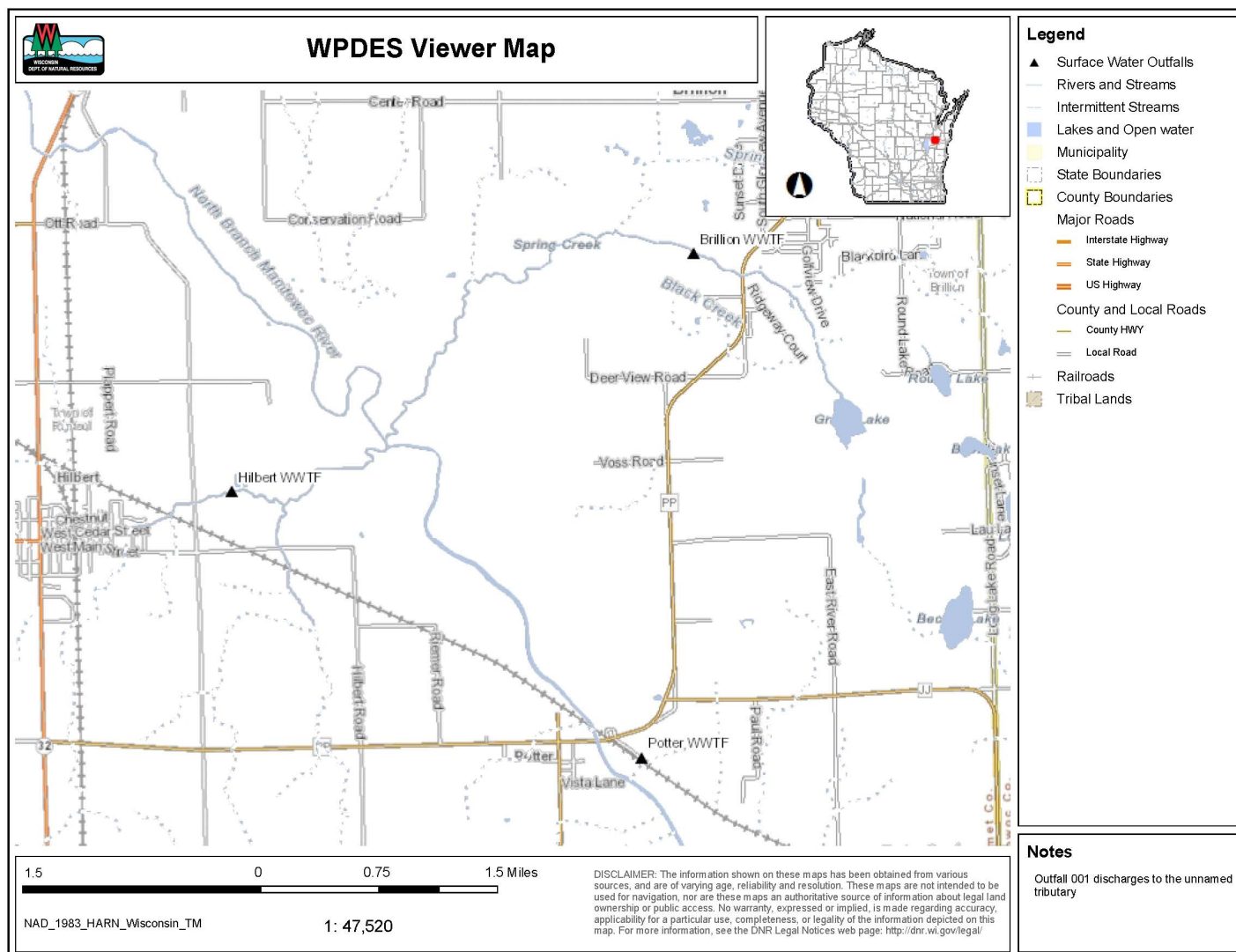
	Acute	Chronic
AMZ/IWC	Not Applicable. 0 Points	IWC = 100%. 15 Points
Historical Data	2 tests used to calculate RP. No tests failed. 0 Points	7 tests used to calculate RP. 1 test failed. 0 Points
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. 0 Points	Same as Acute. 0 Points
Receiving Water Classification	LFF with less than 4 miles to warmwater sport fish community 5 Points	Same as Acute. 5 Points
Chemical-Specific Data	Reasonable potential for limits for no substances based on ATC; Ammonia nitrogen limit carried over from the current permit. Ammonia, copper, nickel, and zinc detected. Additional Compounds of Concern: None 3 Points	Reasonable potential limits for no substances based on CTC; Ammonia nitrogen limit carried over from the current permit. Ammonia, copper, nickel, and zinc detected. Additional Compounds of Concern: None 3 Points
Additives	0 Biocides and 1 Water Quality Conditioners added. P treatment chemical other than Ferric Chloride (FeCl), Ferrous Sulfate (FeSO ₄), or alum used: No 1 Point	All additives used more than once per 4 days. 1 Point
Discharge Category	2 Industrial Contributors: Sargento Food and Ornuia Ingredients 6 Points	Same as Acute. 6 Points
Wastewater Treatment	Secondary treatment 0 Points	Same as Acute. 0 Points
Downstream	No impacts known	Same as Acute.

Attachment #1

	Acute	Chronic
Impacts	0 Points	0 Points
Total Checklist Points:	15 Points	30 Points
Recommended Monitoring Frequency (from Checklist):	2 tests during permit term (year 2, 4, 6, etc.)	1x yearly
Limit Required?	No	Yes Limit = 1.0 TU _c
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2019) and other information described above 2/permit term acute and 1x annually chronic WET tests are recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued).
- According to the requirements specified in s. NR 106.08, Wis. Adm. Code, a chronic WET limit is required. The chronic WET limit shall be expressed as 1.0 TU_c as a monthly average in the effluent limits table of the permit.
- A minimum of annual chronic monitoring is required because a chronic WET limit is required. Federal regulations in 40 CFR Part 122.44(i) require that monitoring occur at least once per year when a limit is present.

Attachment #2



Weekly and Monthly Average Limits based on Chronic Toxicity Criteria:

As noted earlier, the chronic toxicity criteria are evaluated based on the North Branch. The reason for this is that at the same pH and temperatures, NR 105 chronic criteria for Warmwater Sportfish streams are less than half of the criteria for Limited Forage Fish and Limited Aquatic Life streams. With 7Q2 and 7Q10 low flows of zero in the North Branch and the Potter and Hilbert tributaries being located about three miles apart, the same ambient pH and temperature conditions are used at both locations; the only difference in limits will be the decay factor built into the warm-weather limits at Hilbert. The past limit calculations for Hilbert used the decay factors for the months of June through October when the default stream temperatures were above 16°C (61°F). The 1.5-mile distance from the Hilbert outfall to the North Branch is not significant in terms of long-term decay factors based on travel time, past limit calculations increased the limits for June through October by only about 10% due to instream travel time.

One of the reasons for this update, though, is that seasonal ambient pH data are now available on the North Branch of the Manitowoc River which can be used instead of statewide default values. Along with that, monthly (and therefore seasonal) default temperature values are now available for small streams in Wisconsin, as listed in Table 2 of ch. NR 102 as part of the state's new thermal standards which became effective in late 2010 (after the current permits were issued for both facilities). Ambient temperatures are available for each month of the year, meaning Potter and Hilbert could get ammonia limits for each individual month. However, since the ambient pH data are averaged on a seasonal basis, the temperatures used for those same seasonal periods shall represent the highest ambient temperature from Table 2 of NR 102 during the covered months, again because ammonia is more toxic at higher temperature. The table below summarizes the updated ambient pH and temperature values used to calculate limits for Potter and Hilbert.

NOTE: Criteria based on the presence of early life stages of fish are used to calculate criteria for the months of April through September, while "early life stage absent" criteria are applied to the months of October through March. This is consistent with prior limit calculations at both facilities.

Ambient Data and Average Limit Calculations:

	April – May#	June – Sept.	Oct. – Dec.	Jan. - March
Ambient pH	7.98 s.u.	7.91 s.u.	7.94 s.u.	7.69 s.u.
Ambient Temp.	58°F (May)	69°F (July)	50°F (Oct.)	38°F (Mar.)
NR 105 4-day Chronic Criterion	6.26 mg/L	4.68 mg/L	8.86 mg/L	14.69 mg/L
Weekly Ave. Limits*:				
Potter	6.3 mg/L	4.7 mg/L	8.9 mg/L	15 mg/L
Hilbert	6.3 mg/L	5.2 mg/L	8.9 mg/L	15 mg/L

Continued on next page

Attachment #3

	April – May#	June – Sept.	Oct. – Dec.	Jan. - March
NR 105 30-day Chronic Criterion	2.50 mg/L	1.87 mg/L	3.54 mg/L	5.87 mg/L
Monthly Ave. Limits*:				
Potter	2.5 mg/L	1.9 mg/L	3.5 mg/L	5.9 mg/L
Hilbert	2.5 mg/L	2.1 mg/L	3.5 mg/L	5.9 mg/L

* - Effluent limits are rounded to two significant digits.

- April and May were grouped together because the ambient temperatures for those months are below the warm-weather 16°C value at which decay is expected to occur. Decay factors are now only considered in June – September at Hilbert (with the 10% increase in limits) when the ambient temperature is above 16°C.

Antidegradation:

Antidegradation is normally considered when an increased is proposed to an existing permit limit. At both Potter and Hilbert, the changes in limits are due to revised water quality criteria, so any increases are exempt from antidegradation pursuant to s. NR 207.03(1).

Estimated Impact on Dischargers:

The changes in the two permits which result from the above calculations are evaluated to see if the permittees are able to meet any decreases in effluent limits based on current effluent ammonia data.

The recommended limits based on updated ambient data are more restrictive than the current permit limits in the following cases:

Potter)

1. November and December weekly average limit is reduced from 10 to 8.9 mg/L.
2. November and December monthly average limit is reduced from 4.1 to 3.5 mg/L.
3. April weekly average limit is reduced from 10 to 6.3 mg/L.
4. April monthly average limit is reduced from 4.1 to 2.5 mg/L.

Evaluation – To determine the ability of the treatment plant to meet these new limits, a statistical summary of Potter's current data is appropriate. Statistics on the effluent data reported by Potter between the effective date of the current permit (October 1, 2010) and January 31, 2015 are summarized in the following table along with the limits based on updated information.

Attachment #3

Potter Ammonia Data	Ammonia (all data)	Ammonia (April - May)	Ammonia (June - Sept.)	Ammonia (Oct. - Dec.)	Ammonia (Jan. - Mar.)
# of Results	208	32	64	59	53
# of Detects	149	28	44	35	42
Mean	0.42 mg/L	0.29 mg/L	0.33 mg/L	0.63 mg/L	0.38 mg/L
Maximum (date)	16 mg/L (12/1/2010)	2.08 mg/L (5/18/2011)	14.8 mg/L (9/5/2012)	16 mg/L (12/1/2010)	6.49 mg/L (3/2/2011)
1-day P99	5.56 mg/L	2.12 mg/L	4.76 mg/L	8.47 mg/L	4.15 mg/L
4-day P99	3.74 mg/L	1.16 mg/L	3.46 mg/L	5.43 mg/L	2.53 mg/L
30-day P99	1.64 mg/L	0.54 mg/L	1.66 mg/L	2.34 mg/L	1.05 mg/L
Proposed Limits:					
Daily Max.		35 mg/L	35 mg/L	35 mg/L	35 mg/L
Weekly Ave.		6.3 mg/L	4.7 mg/L	8.9 mg/L	15 mg/L
Monthly Ave.		2.5 mg/L	1.9 mg/L	3.5 mg/L	5.9 mg/L

The peak daily and 1-P99 values are all below the corresponding daily maximum limits, the 4-day P99 values are all below the corresponding weekly average limits, and the 30-day P99 values are all below the corresponding monthly average limits. Based on these comparisons, it appears that Potter will be able to meet all of the proposed ammonia limits.

Hilbert)

1. Year-round daily maximum limit is reduced from 11 to 9.4 mg/L based on effluent pH.
2. November and December weekly average limit is reduced from 10 to 8.9 mg/L.
3. November and December monthly average limit is reduced from 4.1 to 3.5 mg/L.

Evaluation – Data evaluations in the February 25, 2014 effluent limits memo were based on effluent information reported only through December of 2013. Since Hilbert has reported additional ammonia results since then, those results were added to the current database. The following table summarizes Hilbert's current ammonia data. Results reported during January of 2015 were excluded from the new database because many of them were indicated as "less than" the reported level of detection, but the listed results were 1 mg/L for all eight samples even though the indicated level of detection was 0.073 mg/L. These exclusions do not affect the final comparisons at Hilbert. In that table, "P99" values refer to the upper 99th percentile values calculated using the procedure in s. NR 106.05(5).

Attachment #3

Hilbert Ammonia Data	Ammonia (all data)	Ammonia (April - May)	Ammonia (June - Sept.)	Ammonia (Oct. - Dec.)	Ammonia (Jan. - Mar.)
# of Results	256	44	84	65	63
# of Detects	251	44	84	62	61
Mean	0.213 mg/L	0.115 mg/L	0.235 mg/L	0.140 mg/L	0.329 mg/L
Maximum (date)	12.88 mg/L (1/8/2014)	2.11 mg/L (4/23/2014)	8.82 mg/L (7/3/2013)	1.94 mg/L (10/27/2014)	12.88 mg/L (1/8/2014)
1-day P99	2.78 mg/L	1.21 mg/L	3.02 mg/L	1.28 mg/L	4.31 mg/L
4-day P99	2.07 mg/L	0.77 mg/L	2.23 mg/L	0.75 mg/L	3.21 mg/L
30-day P99	0.95 mg/L	0.32 mg/L	1.01 mg/L	0.32 mg/L	1.47 mg/L
Proposed Limits:					
Daily Max.		9.4 mg/L	9.4 mg/L	9.4 mg/L	9.4 mg/L
Weekly Ave.		6.3 mg/L	5.2 mg/L	8.9 mg/L	15 mg/L
Monthly Ave.		2.5 mg/L	2.1 mg/L	3.5 mg/L	5.9 mg/L

With one exception, the peak daily and 1-P99 values are all below the corresponding daily maximum limits, the 4-day P99 values are all below the corresponding weekly average limits, and the 30-day P99 values are all below the corresponding monthly average limits.

The exception noted above is that the single result of 12.8 mg/L from 1/8/2014 exceeds the new daily maximum limit of 9.4 mg/L (it also exceeds the current permit limit of 11 mg/L). This may represent a potential concern over the ability to meet the daily maximum limits, but it should be pointed out that the effluent pH reported on 1/8/2014 was only 7.3 s.u. On that day the daily maximum limit at pH 7.3 would have been 52 mg/L, so an effluent ammonia result of 12.8 mg/L would not represent an acute toxicity concern. If this appears to be a potential compliance concern based on the numbers themselves, the alternative available to Hilbert would be a table of daily maximum ammonia limits based on variable effluent pH. One potential exceedance out of 256 results does not appear to warrant a new set of complex daily maximum ammonia limits, but the option is available to the permit drafter if needed.

Based on these comparisons, it appears that Hilbert will be able to meet all of the proposed ammonia limits.

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility:	Village of Hilbert	7-Q₁₀:	0.00 cfs	Temp Dates		Flow Dates	
Outfall(s):	001	Dilution:	25%	Start:	04/01/13		01/01/17
Date Prepared:	7/14/2021	f:	0	End:	05/31/14		05/31/21
Design Flow (Q_e):	0.33 MGD	Stream type:	Limited forage fish community ▼				
Storm Sewer Dist.	0 ft	Qs:Q_e ratio:	0.0 :1				
		Calculation Needed?	YES				

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs) (cfs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)		Weekly Average	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)		(MGD)	(MGD)		(°F)	(°F)	(°F)	(°F)
JAN	37	54	78	0.00	0.407	0.452	0	42	43	54	78
FEB	39	54	79	0.00	0.409	0.524	0	39	42	54	79
MAR	43	57	80	0.00	0.470	0.636	0	42	44	57	80
APR	50	63	81	0.00	0.632	0.695	0	47	53	63	81
MAY	59	70	84	0.00	0.573	0.798	0	59	62	70	84
JUN	64	77	85	0.00	0.481	0.979	0	65	67	77	85
JUL	69	81	86	0.00	0.233	0.304	0	71	74	81	86
AUG	68	79	86	0.00	0.390	0.635	0	72	73	79	86
SEP	63	73	85	0.00	0.467	0.646	0	70	73	73	85
OCT	55	63	83	0.00	0.221	0.296	0	63	65	63	83
NOV	46	54	80	0.00	0.179	0.212	0	55	56	54	80
DEC	40	54	79	0.00	0.178	0.229	0	43	44	54	79